PART II FLATHEAD COUNTY

SEWAGE TREATMENT SYSTEM DESIGN AND CONSTRUCTION STANDARDS

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Chapter 1 - Introduction

1.1 The standard system for on site collection and treatment of domestic sewage in Flathead County usually includes:
A gravity flow sewage collection system from a point 2 feet outside of the structure foundation, a primary treatment facility, usually a standard septic tank, and a secondary treatment and effluent polishing/dispersal system, usually a standard drainfield.

1.2 Other unit options include:
Aerobic package treatment plants, elevated sand mound treatment systems, subsurface (intermittent) sand filters, sand lined trench systems, deep absorption trench systems, waste segregation systems, recirculating sand filter systems, gravelless drainfield systems, nutrient removal systems and constructed wetlands.

1.3 Some system unit options which are used in other areas but not permitted in Flathead County include: Evapotranspiration systems, evapotranspiration/absorption systems and at grade absorption trench systems.

Chapter 2 - Definitions

2.1 "Absorption area" means that area determined by multiplying the length and width of the bottom area of the disposal trench.

2.2 "Absorption system" means any secondary treatment system including drainfields, elevated sand mounds, used for subsurface disposal of pretreated waste effluent.

2.3 "Absorption trench" means an excavation in which the piping for an absorption system is laid for the purpose of distributing pretreated waste effluent into the ground.

2.4 "Advanced treatment" means a treatment process that provides effluent quality in excess of primary treatment.

2.5 "Aerobic sewage treatment unit" means a sewage treatment plant that incorporates a means of introducing air and oxygen into the sewage so as to provide aerobic biochemical stabilization during detention period. Aerobic sewage treatment facilities may include anaerobic processes as part of the treatment system.

2.6 "Bedrock" means material that cannot be readily excavated by hand tools, or material that does not allow water to pass through or that has insufficient quantities of fines to provide for the adequate treatment and disposal of wastewater.

2.7 "Bedroom" means any room used for sleeping. An unfinished basement must be considered as an additional bedroom.

2.8 "BOD5 (five-day biochemical oxygen demand)" means the quantity of oxygen used in the biochemical oxidation of organic matter in 5 days at 20 degrees centigrade under specified conditions and reported as milligrams per liter (mg/L).

2.9 "Building drain" means the pipe extending from the interior plumbing to a point 2 feet outside the foundation wall.

2.10 “Building sewer” means the pipe connecting the house or building drain to the public sewer or private sewer.

2.11 “Cleanout” means an access to a sewer line at least 4 inches in diameter, extending from the sewer line to the ground surface, used for access to clean a sewer line.

2.12 “Chemical nutrient reduction” means a sewage treatment system that incorporates the systematic addition of one or more chemicals into the effluent in order to reduce the concentration of one or more chemical components (such as nitrate or phosphorus).

2.13 “Coefficient Of Uniformity”, CU – is equal to D60/D10 where D60 is the grain diameter (in mm) corresponding to 60 percent passing and D10 is the grain diameter (in mm) corresponding to 10 percent passing, by weight.

2.14 “Design flow” means the peak flow (daily or instantaneous, as appropriate) for sizing hydraulic facilities, such as pumps, piping, storage, and drainfields and means the average daily flow for sizing other treatment systems.

2.15 “Distribution lateral” means a perforated pipe used in the dispersion of septic tank or other treatment facility effluent into disposal trenches, seepage trenches, or seepage beds.

2.16 “Dosing frequency” means the number of times per day that effluent is applied to a drainfield, sand filter, or sand mound, or to a section of a drainfield, sand filter, or sand mound.

2.17 “Dosing tank” means a watertight receptacle placed after the septic tank or after another treatment device, equipped with an automatic siphon or pump designed to discharge effluent.

2.18 “Dosing volume” means the volume of effluent (in gallons) applied to a drainfield, sand filter, or sand mound each time a pump is turned on or each time a siphon functions.

2.19 “Drainrock” means the rock used in a drainfield, sand mound, or sand filter. Drain rock must be washed, must range in size from ¾ inch to 2-1/2 inches, and must contain no more than 2 percent passing the #8 sieve. The material must be of sufficient competency to resist slaking or dissolution. Gravels of shale, sandstone, or limestone may degrade and may not be used.

2.20 “Dwelling or residence” means any structure, building, or portion thereof, which is intended or designed for human occupancy and supplied with water by a piped water system.

2.21 “Effective diameter” means the maximum diameter of the smallest 10 percent of the particles.

2.22 “Effluent” means the liquid discharge of liquid waste from any treatment system or process.

2.23 “Effluent filter” means an effluent treatment device installed on the outlet of a septic tank designed to prevent the passage of suspended matter larger than 1/8 inch in size.

2.24 “Fats, oils, grease (FOG)" means a component of sewage typically originating from food stuffs (animal fats or vegetable oils) or consisting of compounds of alcohol or glycerol with fatty acids (soaps and lotions).

2.25 “Greywater” means any wastewater other than toilet wastes or industrial chemicals and includes, but is not limited to, shower and bath wastewater, kitchen wastewater, and laundry wastewater.

2.26 “Grease trap” means a device designed to separate grease and oils from the effluent.

2.27 “High-strength waste**”** means effluent from a septic tank or other treatment device that has BOD5 greater than 300 mg/L, and/or TSS greater than 150mg/L, and/or fats, oils, and grease greater than 25mg/L

2.28 “Impervious layer” means any layer of material in the soil profile that has a percolation rate slower than 120 minutes per inch.

2.29 “Individual sewage system” means any sewage system that is not a public system and that serves one living unit or commercial structure.

2.30 “Infiltrative surface” means the soil interface that receives the effluent wastewater below the drain rock or sand.

2.31 “Influent” means the wastewater flow stream prior to any treatment.

2.32 “Manifold” means a solid (nonperforated) main wastewater line that distributes effluent to individual distribution pipes.

2.33 “Mechanical sewage treatment systems” mean systems that contain any of the following: any combination of interrelated parts that apply energy to transport or allows the transport of sewage and/of effluent, such as pumps; units that employ more complicated treatment methods than the simple processes of non-mechanical systems, such as trickling filters, evaporation ponds, intermittent sand filters, etc.; devices that produce intermittent dosing of drainfields, such as siphons; or any type of equipment that requires frequent attention and/or maintenance to keep it in proper working order, as determined by the Department.

2.34 “Multiple-user sewage system” means a nonpublic sewage system that serves, or is intended to serve, 3 through 14 living units or 3 through 14 commercial structures. The total population served may not exceed 24. In estimating the population served, the Department shall multiply the number of living units times the county average of persons per living unit based on the most recent census data. Individual or shared commercial sewage systems with design flows greater than 700 gallons per day are considered as multiple-user for purposes of design requirements.

2.35 “On-site wastewater treatment system” means a system for collection, transportation, treatment, and disposal of wastewater within the boundary of each lot or parcel.

2.36 “Passive nutrient reduction” means a sewage treatment system, other than elevated sand mound, intermittent sand filter, or recirculating sand filter, that reduces the effluent concentration of one or more components (such as nitrate or phosphorus) without the addition of chemicals and without mechanical aeration.

2.37 “Percolation test” means a standardized test used to assess the infiltration rate of soils and to aid in sizing absorption areas and in determining site suitability.

2.38 “Primary treatment” means a treatment system that provides sufficient retention time to settle the solids in raw sewage and that retains scum within the system.

2.39 “Residential strength wastewater” means effluent from a septic tank or other treatment device with a BOD5 less than or equal to 300 mg/L, TSS less than or equal to 150 mg/L, and fats, oils, and grease less than or equal to 25 mg/L.

2.40 “Secondary treatment” means a biological treatment process coupled with solid/liquid separation. The effluent from secondary treatment should generally have a BOD5 less than 30 mg/L and TSS less than 30 mg/L.

2.41 “Septic tank” means a watertight storage tank receiving raw sewage and providing primary treatment by means of settling, anaerobic digestion, and scum removal.

2.42 "Sewer invert" means inside bottom (or flow line) of a sewer pipe.

2.43 "Shared sewage system" means a sewage system that serves or is intended to serve two living units or commercial structures**.**

2.44 "Siphon" means a pipe fashioned in an inverted U shape and filled until atmospheric pressure is sufficient to force a liquid from a reservoir in one end of the pipe over a barrier and out the other end. Siphons are sometimes used to uniformly dose a drainfield from a dosing tank or chamber.

2.45 "Synthetic drainage fabric" means a nonwoven drainage fabric with a minimum weight per square yard of 4 ounces, a water flow rate of 100 to 200 gallons per minute per square foot, and an apparent opening size equivalent to a #50 to #110 sieve.

2.46 "Tertiary treatment" means additional removal of colloidal and suspended solids by chemical coagulation and/or granular medium filtration for the reduction of nutrients.

2.47 "TSS (Total Suspended Solids)" means solids in sewage that can be removed readily by standard filtering procedures in a laboratory and is reported as milligrams per liter (mg/L).

2.48 "Uniform pressure distribution" means an effluent distribution system where all pipes are pressurized, the head at any orifice is at least 1 psi, the effluent is pumped (or delivered by siphon) to the next portion of the treatment system in a specific time interval and that the difference in flow (measured in gallons per day per square foot) throughout the drainfield, sand filter, or sand mound is less than 10 percent.

2.49 "Wastewater" means liquid waste that is discharged from a dwelling, building, or other facility, including household, commercial, or industrial wastes; human excreta; or animal and vegetable matter in suspension or solution.

Chapter 3 - Site Evaluations

3.1 General

Information concerning soil and site conditions is needed for the design of on-site wastewater treatment systems. Those factors which must be evaluated are thickness of permeable soil above seasonally high ground water, bedrock or other limiting layer, soil properties, land slope, topographic position, flooding hazard and amount of suitable area available, and setback distances required in Table 1. For systems with a design wastewater flow greater than 1,000 gallons per day, the potential for ground water mounding must be evaluated.

3.2 Evaluation of Soil Factors

Soil properties must be evaluated using a soil profile and should be supported by percolation tests.

3.3 Existing Soil Information

Soil surveys are usually found at the local USDA Natural Resources Conservation Service (NRCS) office. Soil surveys offer good preliminary information about an area and can be used to identify potential problems; however, they cannot substitute for a field investigation. If available, the most recent version of appropriate section(s) of the soil survey must be provided, including Sanitary Facilities, Engineering Index, Physical Properties, Water Features, and Soil Features.

3.4 Soil Profile Descriptions

1) Soil observation pits within 25 feet of the boundaries of the proposed drainfield are required for soil descriptions. For proposed primary and replacement drainfields that are not located in the same immediate area, a soil profile may be required for each proposed drainfield area. The minimum depth of soil profile

descriptions must be 8 feet unless a limiting layer is encountered at a shallower depth. The soil profile may be completed to a greater depth to demonstrate compliance with nondegradation rules for phosphorous breakthrough.

2) The following soil properties must be evaluated to the full depth of the holes and reported:
Thickness of layers or horizons;
Texture, structure, and consistence of soil horizons;
Color (preferably described by using the notation of the Munsell color scheme) and color variation (redoximorphic features);
Depth of water, if observed;
Estimated depth to seasonally high ground water and basis for the estimate;
Depth to and type of bedrock, if observed;
The percentage of the soil volume occupied by particles greater than 2 mm in diameter;
Plasticity; and
Other prominent features such as roots, etc.

3.5 Percolation Tests

1) If required, percolation tests must be conducted at the depth of proposed construction. For elevated sand mounds the depth of the percolation test hole must be 12 inches. Additional percolation tests may be required to determine the existence of a limiting layer. The percolation tests must be performed in accordance with the procedures contained in the Montana Department of Environmental Quality (MDEQ) Circular DEQ 4. When the proposed replacement area is not immediately adjacent to the primary drainfield, at least one percolation test must be conducted within the boundaries of the replacement area.

2) When more than one percolation test is conducted within the boundaries of a proposed drainfield, the percolation rate will be determined based on the arithmetic mean of the percolation test values. However, if any percolation test values exceed 120 minutes per inch, the drainfield location must be moved so that it does not include soils with percolation rates slower than 120 minutes per inch. Additional percolation tests are required within the newly designated area.

3.6 Site Factors

1) The land slope, potential for flooding and surface water concentration, and amount of suitable area must be evaluated.

2) Type and percent of land slope
The type (concave, convex, or plane), percent, and direction of land slope must be reported, along with the method of determination.

3) Flooding and surface water
The potential for flooding or accumulation of surface water from storm events must be evaluated.

4) Amount Of Suitable Area
Sufficient suitable soil must be available for the use intended for the initial and replacement absorption area while maintaining the required minimum horizontal setback distances from water supplies, surface waters, property lines, etc. For sites that do not have a defined use, an approved primary and replacement absorption area will be limited for a specific amount of sewage application based on the area described and the application rate allowed.

5) Ground Water Quality Impact
Compliance with the nondegradation requirements of the Montana Water Quality Act (75-5-301, MCA) must be demonstrated.

6) Ground Water Monitoring

When required, ground water monitoring must be conducted in accordance with instructions provided by the Department.

Chapter 4 - Wastewater Flow Projections

4.1 General

The purpose of this chapter is to provide a method for estimating wastewater flows.

4.2 Residential Wastewater Flows

Minimum design wastewater flow from a single family dwelling unit in Flathead County is 350 gallons per day. For dwelling units which have more than 3 bedrooms, the design wastewater flow shall be increased by 100 gallons per day per bedroom.

4.3 Nonresidential Wastewater Flow

1) Typical daily flows for a variety of commercial, institutional, and recreational establishments are presented in Tables 5 -1, 5-2 and 5-3 of circular DEQ 4. For design purposes, the typical flows must be used as minimum design flows. Greater design flows may be required where larger flows are likely to occur, such as resort areas. Design flow must be computed using the total number of units in the proposed facility times the typical daily flow in the tables, with no reduction allowed for occupancy rates. Where the system includes several different types of uses from the tables, each use must be computed separately, and the design flow must be based on the sum of all of the uses. A means of flow measurement (such as flow meters or pump run-time meters) may be required.

2) As an alternative to the flows listed in the tables, design flow may be based on actual water use data from similar facilities. Because this water use data will typically be monthly averages, the peak design flow must be a minimum of 1.5 times the average flow. System components may be added (or enlarged) to address peak flows to allow drainfields to be sized based on average flow.

4.4 Greywater

Greywater must be provided the same treatment required for other wastewater.

4.5 Wastewater strength

On-site subsurface sewage treatment and dispersal systems must be used only for residential strength wastewater. Wastewater exceeding the limits for residential strength wastewater must be pretreated to equal or better quality and equal or lower strength prior to discharging to a subsurface sewage treatment and dispersal system. For example, sewage from recreational vehicle holding tanks have BOD levels as high as 15 times that of residential strength wastewater and must be pretreated accordingly. Wastewater containing toxic or non biodegradable constituents shall not be discharged into a subsurface sewage treatment and dispersal system unless it is pretreated to sufficiently remove these incompatible constituents.

Chapter 5 - Gravity Components

5.1 Pipe and fittings from the dwelling or structure to the septic tank shall conform to or exceed ASTM designation D3034, or ASTM D 1785 (schedule 40 or 80) and must be joined by an integral bell-and-spigot

joint with rubber elastomeric gasket or solvent cement joints. PVC pipe shall have a minimum Standard Dimension Ratio of SDR 35, and the compound type shall meet or exceed ASTM D1784.

5.2 Transition connections to other materials must be made by adapter fittings or one piece molded rubber couplings with appropriate bushings for the respective materials. All fittings must be at least of equivalent durability and strength of the pipe itself.

5.3 The line between the dwelling or structure and the septic tank should be kept between ten (10) and twenty-five (25) feet in length. Should a greater distance be necessary, at least one clean-out shall be installed for distances up to fifty (50) feet and at least one clean-out for every fifty (50) foot length thereafter. If the line between the dwelling or structure and the septic tank has one or more angles greater than 45 degrees, a clean-out shall be installed at each angle greater than 45 degrees to facilitate periodic and necessary maintenance.

5.4 A building sewer or private sewer must be at least 4 inches in diameter and must be placed at a minimum slope of ¼ inch per foot toward the point of discharge. Where it is impractical to obtain such a slope such piping which is larger than 4 inches in diameter may have a slope of not less than 1/8 inch per foot when approved by the reviewing authority.

5.5 Where it is necessary for water and sewer lines to cross, the sewer line shall lie at least eighteen (18) inches below the water line, (or) a minimum of eighteen (18) inches above the water line, and shall be of water tight construction equal to water supply piping, with water tight joints, for at least ten (10) feet on either side of the crossover point. Otherwise such lines shall be separated horizontally by at least ten (10) feet. Compaction of fill material at the crossing point must be provided so as to prevent settlement.

Chapter 6 Mechanical Components

6.1 General

All mechanical components shall be field tested during the inspection.

6.2 Sewage Pumping Stations

1) General
Pumping stations may be required to lift raw or partially treated sewage into a public sewage collection system or to a site suitable for an on site treatment and dispersal system.

2) Design
a) Pump Chambers
Pump chambers shall be designed so that pumps, valves, or other mechanical devices are readily accessible without entering the chamber. All chambers shall be watertight.

b) Pumps and controls
Stations receiving sewage from private sewers must be provided with pumps and controls that are corrosion resistant and are listed by Underwriters Laboratories, Canadian Standards Association, or other approved testing and/or accrediting agency as well as meeting the requirements for National Electric Code Class I, Division 2 locations.

c) Submersible pumps and motors must be designed specifically for totally submerged operation and meet the requirements of the National Electric Code for such units. In addition, the design must provide for the pumps and motors to be totally submerged at all times. An audible or visible alarm must be provided to indicate failure of the system.

d) Raw sewage pumps must be capable of passing spheres of at least 2 inches in diameter, or be grinder pumps capable of handling raw wastewater.

e) Pumps handling sewage from private sewers that has had the settleable solids removed must be classified as raw sewage pumps or sewage effluent pumps. Multiple pumps are not required.

f) A high water alarm shall be provided for all pump chambers.

g) The power supply for the pump and alarm must be provided by separate circuits. All wiring shall comply with NEC Class L Division I, Group D requirements (where applicable) and all State and local codes.

6.3 Force Mains

1) Discharge lines from raw sewage pump stations must be at least 2 inches in diameter. The discharge line must be sized to provide a minimum velocity of 2 feet per second.

2) Discharge lines from settled sewage or grinder pump stations may be as small as 1 inch diameter and there is no minimum velocity limit in the force main.

3) The forcemain from the pump to a minimum of five (5) feet beyond the pump chamber shall be schedule 80 PVC, or an approved equal. A quick disconnect device shall be provided in the forcemain for pump removal and must be accessible without the need for entering the chamber. From five (5) feet beyond the dosing chamber to the drainfield site, the forcemain shall consist of Class 160 or 200 PVC, Schedule 40 PVC or other pipe of equivalent strength and durability which is acceptable to the Department. Forcemains shall be bedded (six (6) inches above and below the pipe) in pipe bedding sand or other fine grained soil free of gravel over one (1) inch in size. Debris, frozen material, large clods, stones (greater than 8 inches in diameter), organic material or other unsuitable materials shall not be used for backfill within 24 inches of the top of the pipe. Compaction under and around the pipe shall be sufficient to prevent movement of the pipe due to settlement.

4) Forcemains shall be designed so that damage from frost or vehicles will not occur.

5) "No-hub banded steel couplings" are unacceptable forcemain connectors.

6.4 Dosing Systems

1) General
Dosing is used to convey a large volume of effluent to the drainfield at one time through the use of a pump or siphon.

2) Dosing is accomplished by alternate storage and intermittent batch delivery of effluent from one treatment unit, (usually a septic tank) to the next, (usually a subsurface drainfield), involving a dose storage chamber and either a pump or siphon to provide the batch delivery.

6.5 Dosing Tanks

1) Dosing tanks must meet the material requirements for septic tanks and must be watertight.

2) The reserve storage volume of a pump dosing tank must be at least equivalent to 25 percent of the daily design flow. The reserve storage volume is computed from the high-level alarm. The tank must also include adequate liquid capacity for pump submergence and the dose volume. The required volume of the dosing tank

must not be considered as any portion of the required volume of the septic tank. The dosing tank must be separated from the septic tank by an air gap to eliminate the possibility of siphoning from the septic tank.

3) Dosing tanks must be provided with access ports sufficiently large to maintain the tank and pumps. Pumps, valves, and other apparatus requiring maintenance must be accessible from the surface without entering the tank or be located in a dry tank adjacent to the wet chamber.

4) The chamber volume shall be sufficient to provide storage for at least one days design flow from the facilities being served.

6.6 Pump Systems

1) Dosing pumps shall meet all of the design criteria for effluent pumps included in "Sewage Pump Stations" above.

2) Pump controls shall be capable of providing the proper dose.

3) The applicant must provide all data requested on the pump information sheet provided by the Department for review and approval before a permit can be issued.

6.7 Siphon Systems

1) Systems using siphons must be designed in accordance with the recommendations of the siphon manufacturer and the criteria outlined under each of the particular treatment facilities in these Construction Standards.

2) Systems using a siphon should have a dose counter installed to check for continued function of the siphon.

6.8 Effluent Distribution

1) Design

a) The EPA Design Manual, *On-site Wastewater Treatment and Disposal Systems* pages 284 to 292 is recommended as a procedural guideline in the design of uniform pressure distribution systems.

b) Uniform pressure dosing systems shall be designed by a registered professional engineer or a designer certified by the Flathead City-County Health Department.

c) The pressure distribution pipe shall be one (1) to two (2) inch nominal diameter; Class 160, Schedule 40 or Schedule 80 rigid plastic pipe.

d) The distribution laterals shall be bedded in drainrock six (6) inches in depth below and two (2) inches in depth above the pipe. The material used to cover the stone shall be synthetic drainage fabric or two or more layers of untreated building paper. A 5 inch layer of straw may be substituted when these materials are unavailable. Nonporous plastic or treated building paper may not be used.

e) Cleanouts must be provided at the end of every lateral. The cleanouts must be within 6 inches of finished grade and should be made with either a long-sweep elbow or two 45-degree bends. A design engineer may specify the use of capped ends that are replaced after flushing if, in his opinion, this is a more feasible option than long sweep cleanouts. A metal location marker must be provided for each cleanout.

f) The field shall be dosed one (1) to four (4) times per day. The size of the dosing pump or siphon and pipe shall be selected to maintain a minimum pressure of one (1) psi or 2.3 feet at the distal end of each distribution

line. For orifices smaller than 3/16/inch diameter, the minimum pressure must be 2.16 psi (five feet of head) at the end of each distribution line.

g) Maximum perforation spacing shall be five (5) feet. An equivalent design that assures uniform distribution may be provided with the approval of the Department.

h) The dose volume of a pressure-distribution system must be equal to the drained volume of the force main and manifold, plus a volume that should be 10 times but must not be less than five times the distribution pipe volume. Where the system is designed to operate on a timer, more frequent, smaller doses may be used. The minimum dose volume must still be equal to the drained volume of the force main and manifold, plus a volume equal to at least two times the distribution pipe volume. Where timers are used, additional controls are necessary to prevent pump operation at low-water level.

i) The duration of each discharge may not exceed 15 minutes to promote uniform distribution.

j) Pressure distribution systems must be field-tested to verify uniform distribution, which is typically done by a test showing approximately equal squirt height or gauge pressure measurements. The difference in head across laterals of equal elevation shall not be greater than 10 % of the highest head. If the distribution laterals are placed with the orifices in an upright position for the hydraulic demonstration, they shall be rotated 180 degrees or the orifices shall be covered with an approved orifice shield prior to placing the gravel and covering materials. If orifice shields are used, each lateral shall have a 3/16 inch hole drilled in the bottom of the pipe near the last orifice to provide for draining the lateral after each dosing cycle.

Chapter 7 - Primary Treatment Systems

7.1 General

1) All sewage treatment systems must provide at least primary treatment prior a subsurface treatment & dispersal system using uniform pressure distribution.

2) The primary treatment device shall consist of a concrete septic tank, unless another device(s) can be demonstrated to be acceptable and effective in primary treatment of sewage and that the alternative device(s) can meet the design specifications of a concrete septic tank for strength, capacity and durability. Any primary treatment device other than a concrete septic tank must be reviewed and approved by the Department.

3) The Department may require that special design criteria and construction techniques be utilized when septic tanks, pumping chambers and sealed lines are proposed to be located within two (2) feet of the groundwater table, bedrock, impermeable soils, or extremely coarse soils (gravels).

4) All liquid waste and washwater must discharge into the primary treatment system. Roof, footing, garage, surface water drainage, and cooling water must be excluded. Backwash from water softeners should not be discharged into septic tanks if the drainfield area has clay soils with shrink/swell properties.

7.2 Design

1) A septic tank consists of one or more chambers.

2) Specifications of septic tanks shall be reviewed in accordance with the State Department of Environmental Quality's most current edition of Circular DEQ 4 and any other publication deemed pertinent by the Department.

3) Any person, firm, partnership or other entity that proposes construction of a septic tank(s) for their own personal use or sale and distribution to the public, must have the plans and specifications of the septic tank(s) reviewed and approved by the Department prior to construction or sale.

4) Septic tanks must be made of materials resistant to the corrosive environment found in septic tanks. The empty tank must be structurally sound and capable of withstanding loads created by 6 feet of burial over the top of the tank. Tanks must be installed in accordance with manufacturer's recommendations.

5) A septic tank must provide an air space above the liquid level, which will be equal to or greater than 10 percent of its liquid capacity. Dose tanks do not need to meet the 10 percent air space requirement. Each compartment of the septic tank must be vented back to the inlet pipe.

6) Inspection ports measuring at least 8 inches in diameter must be provided above each inlet. A manhole access at least 1.75 square feet in size must be provided into each compartment. The effluent filter must be provided an access large enough to maintain the filter. This filter access must have a covered riser extending to the finished ground surface. If access lids are concrete, they must be at least 2 inches thick.

7) The walls and floor of concrete tanks must be at least 3 inches thick and adequately reinforced with steel. The empty tank must be structurally sound and capable of withstanding loads created by 6 feet of burial over the top of the tank. Concrete for septic tanks must have a water/cement ratio less than 0.45, a 28-day compressive strength of at least 4,000 psi, and must be made with sulfate-resistant cement (tricalcium aluminate content of less than 8 percent).

8) The inlet into the tank must be at least 4 inches in diameter and enter the tank at least 3 inches above the liquid level.

9) The inlet of the septic tank and each compartment must be submerged by means of a vented tee or baffle. Tees and baffles must extend below the liquid level to a depth where at least 10 percent of the tank's liquid volume is above the bottom of the tee or baffle.

10) Tees or baffles must extend above the liquid level a minimum of 7 inches.

11) Baffle tees must extend horizontally into the tank to the nearest edge of the access to facilitate baffle maintenance.

12) Outlets must include an effluent filter as outlined below and approved by the reviewing authority.

13) On combination septic/dosing tanks, the septic tank outlet is considered to be in the wall dividing the septic compartment(s) and the dosing compartment.

1) The outlet of the tank must be at least 4 inches in diameter.

7.3 Sizing of Septic Tanks

1) Minimum capacities are:
   a) A minimum acceptable size of septic tank is 1,000 gallons for any system.
      For 1 to 3 bedrooms, the minimum size septic tank is 1,000 gallons.
      For 4 to 5 bedrooms, the minimum size septic tank is 1,500 gallons.
      For 6 to 7 bedrooms, the minimum size septic tank is 2,000 gallons.

   b) In situations where bedrooms are not used to size the septic tank and for flows of less than or equal to 1,500 gallons per day, the tank must have a capacity of at least 1.5 times the daily design flow.

c) For flows of greater than 1,500 gallons per day, the tank must have a minimum capacity equal to 1,125 gallons plus 75 percent of daily wastewater flow; of V=1,125 + 0.75Q where V is the net volume of the tank in gallons and Q is the daily wastewater flow in gallons.

d) For a septic tank less than or equal to 5,000-gallon liquid capacity, depths greater than 78 inches must not be used in computing tank capacity.

e) For the septic tank greater than 5,000-gallon liquid capacity, the maximum liquid depth is determined by dividing the liquid length by a factor of 2.5.

2) The nominal length of the septic tank must be at least twice the width (or diameter) of the tank.

3) Dose tanks are excluded from these length, width, and depth requirements.

4) Tank capacities for gray water disposal systems shall be handled on a case by case basis.

5) Where remodeling of the system is required, existing tank capacities shall be evaluated on a case by case basis.

7.4 Installation

1) The septic tank must be located where it is readily accessible for inspection and maintenance.

2) Where the top of the septic tank is located more than 18 inches below the finished grade of the ground surface, manhole risers shall be installed, extending to within at least eight (8) inches of finished grade, to facilitate inspection and cleaning of each compartment of the tank. The riser pipe(s) shall be of sufficient size to provide access to each compartment for inspection and sludge removal.

3) Sealing material shall be placed around any pipe where it enters or exits the tank to assure that no leakage occurs. Hydraulic grout (an expanding cement product designed to seal penetrations through water filled concrete vessels) is preferred, however, oakum and tar, tar strips or similar materials are acceptable if used properly. Other materials must be approved by the Department prior to using. Masonry cement, plain cement and sand, etc., are not acceptable sealants.

NOTE: Extremes in temperatures may require that special precautions be taken during application and curing of the sealant.

7.5 Testing

1) All tanks must be watertight. Tanks used for commercial facilities, multiple-user systems or public systems must be tested in place for watertightness. Watertightness testing for a concrete tank may be conducted using a water test. Watertightness testing for a polyethelene tank may be conducted using a water test, a vacuum test, or a pressure test.

2) Water testing must be conducted by sealing the outlets, filling the septic tank to its operational level, and allowing the tank to stand for at least 8 hours. If there is a measurable loss (2 inches or more), refill the tank and let stand for another 8 hours. If there is again a measurable loss, the tank must be rejected.

3) Vacuum testing must be conducted by sealing all inlets, outlets, and accesses, then introducing a vacuum of 4 inches of mercury. If the vacuum drops in the first 5 minutes, it must be brought back to 4 inches of mercury. If the septic tank fails to hold the vacuum at 4 inches of mercury for 5 minutes, the tank must be rejected.

4) For pressure testing a tank, all inlets, outlets, and access ports must be sealed and adequately secured. The tank must be charged with 3 psig. Allow tank pressure to stabilize. Disconnect the air supply. If there is any

noticeable pressure drop in 1 hour, the tank must be rejected or repaired. Repeat the test after repair. Release air carefully through an appropriate valve mechanism.

7.6 Effluent Filters

1) Effluent filters must be used in all systems prior to secondary treatment devices. The effective opening in the effluent filter must be no larger than 1/8- inch.

2) Effluent filter inlets must be located below the liquid level at a depth where 30 to 40 percent of the tank's liquid volume is above the intake of the filter.

3) The filter must provide a minimum clean water flow rate of 4.2 gallons per minute when tested in a setup that places the filter in its operation position and the clean water head is at the center of a 4-inch sewer line at the septic tank inlet.

4) All septic tank effluent must pass through the effluent filter. No by-pass capability may be designed into the effluent filter. A high-water alarm should be installed to signal that the filter has clogged and needs maintenance.

5) The effluent filter must be secured so that inadvertent movement does not take place during operation or maintenance. The filter handle must extend sufficiently close to the ground surface to facilitate maintenance without the use of special tools.

6) Openings developed by penetration, saw cut, or equivalent must be process controlled and all mold flash and penetration burrs removed.

7) The effluent filter material must be designed such that the filtering medium maintains structural integrity throughout the life of the device. The filter medium must not tear or otherwise distort so as to make the filter inoperable during normal operation. The entire filter must be constructed of proven corrosion resistant material for use in wastewater applications.

8) The effluent filter manufacturer must provide documentation that shows at least three years successful field-testing and operation or that the filter meets the design standard for effluent filters in ANSI/NSF Standard 46. The documentation must show that under normal use the filter is capable of operating a minimum of 3 years between maintenance intervals.

9) The effluent filter manufacturer must provide installation and maintenance instructions with each filter. The installer must follow the manufacturer's instructions when installing the filter and must use the manufacturer's recommendations for sizing and application. The installer should leave the installation and maintenance instructions with the owner of the system.

10) The effluent filter manufacturer must certify to the reviewing authority that the filter meets the requirements of this standard.

7. 6 Grease traps

Establishments such as restaurants that produce grease exceeding the limits of residential strength wastewater must be provided with grease traps.

7. 7 Maintenance

Owners of septic systems should obtain septic tanks maintenance recommendations published by Montana State University Extension Service, which are available through Montana County Extension Service offices located in each county. Two of these publications are *Septic Tank and Drainfield Operation and Maintenance* and *Septic*

*System Inspection and Troubleshootin*g. Those who own the systems with siphons, pumps, or controls should carefully adhere to manufacturer's recommendations for operation and maintenance and seek guidance from the county extension service.

Chapter 8 - Treatment Site Modifications

8.1 General

Site modifications, as described in this chapter, may only be used for replacement of failing systems. The following systems may not be used for new systems in subdivisions, although cut systems and fill systems may be used for replacement areas for new subdivisions, provided the site preparation (cut or fill) is completed prior to approval of the subdivision.

8.2 Artificially Drained Site

1) General
Prior to construction of any site drainage system such as field drain, under drain, or vertical drain, an evaluation of the site must be performed, including soil profile descriptions; slope; depth to bedrock or impervious layer; estimation of depth to seasonally high ground water; topography; distance to wells, seeps, streams, ponds, or other open water; and any other pertinent considerations.

2) Design and Construction of the Drain System
The applicant shall provide the Department with a proposed system design. The design shall include:

a) The drainage method chosen (curtain drain, vertical drain, or under drain) and the reason for this choice must be detailed. Drawings showing dimensions of the drain system and materials to be utilized must be provided.

b) The type of sewage treatment system to be approved must depend upon the depth to seasonally high ground water. A minimum of 4 feet from the bottom of the trench over the entire area of the proposed drainfield and replacement area to the seasonally high ground water must have been achieved by the site drainage system. An adequate horizontal separation distance must be maintained between the drain and the absorption system in order to reduce the potential for effluent to enter the drain.

c) The drainage system must be constructed according to the specific design approved by the reviewing authority.

d) The reviewing authority may require monitoring of the depth to seasonally high ground water after installation of the drainage system.

8.3 Cut Site

1) General
Drainfield trenches for these systems must meet the same requirements as a standard drainfield trench.

2) In new subdivisions cut areas for the replacement drainfield must be physically completed prior to approval. Two test holes must be excavated in the cut area to a depth of 10 feet below the depth of the cut, and detailed soil profile descriptions must be provided. If required, percolation tests must be performed after the cut has been completed. If a limiting layer is encountered at 7 to 10 feet, a description of how this limitation will be overcome must be provided.

3) Cut systems will only be considered on slopes that do not exceed 25 percent and where downhill slope for at least 25 horizontal feet below the cut area is not greater than 25 percent.

4) Design
The applicant shall provide the Department with a proposed system design. The design shall include: Supporting field data and a complete lot layout must be submitted showing the cut areas, the uphill and downhill slope, and slope across the cut area. Slope across the drainfield site must be a uniform slope.

5) Construction
The designer shall submit a letter of verification indicating that the site meets minimum requirements of applicable rules after the cut has been completed.

Fill Site

1) General

a) In new subdivisions the entire area necessary for the replacement drainfield must be filled prior to final approval of the system.

b) Fill systems may not be installed on soils with a percolation rate slower than 60 minutes per inch. Side slopes on the fill may not exceed 25 percent (4:1).

2) Fill material

Fill material shall be of similar porosity and texture as the underlying natural soil. Clay content, (material passing a #200 sieve), shall not exceed 10 % by weight. Fill material with significant amounts of cobbles and boulders (15 % or more) is unacceptable.

3) Design

a) System configuration, dimensions, and orientation must be approved by the reviewing authority prior to the placement of fill material.

b) Fill must be of suitable depth to provide the minimum separation distances in from the finished ground surface to a limiting soil layer.

c) Three percolation tests evenly spaced across the completed fill must be performed at the depth of the proposed infiltrative surface as a basis for design application rate.

d) The absorption system must be sized on the basis of the percolation rate for either the soil beneath the fill material or the percolation rate of the fill material, whichever is slower.

e) Location and design of subsurface treatment and dispersal systems in filled areas shall meet the same requirements as specified for those systems in undisturbed areas.

f) At least one test hole must be excavated in the filled area to a depth of 10 feet below the final surface, and detailed soil profile descriptions must be provided.

4) Construction

a) All vegetative cover must be removed for the area to be filled.

b) Fill material must not be put in place when the fill or the original soil surface is frozen.

c) Fill material must be placed in lifts not to exceed 12 inches.

d) If not used immediately, the fill area must be seeded with a suitable grass to provide protection against erosion and aid in stabilization.

e) Absorption trenches must be set back at least 24 feet from the lower edge of the filled area on slopes of 6 percent or greater. For slopes less than 6 percent, absorption trenches must be set back at least 3 feet on all sides prior to starting the side slope.

Chapter 9 - Standard Sewage Treatment Systems

9.1 General

The standard system for on site sewage treatment in Flathead County consists of a septic tank and a subsurface drainfield with trenches varying in depth from 12 inches to 36 inches. Other treatment systems used in Flathead County are considered as "Alternative Systems" and are covered in other sections of these Construction Standards.

9.2 Standard Subsurface Drainfield

1) Description

The standard subsurface drainfield shall consist of a drainfield of two (2) or three (3) foot wide trenches with vertical sides and substantially flat bottom dug to a minimum depth of 12 inches and a maximum depth of 36 inches.

2) Sizing

a) Each drainfield for residential structures shall be sized by the number of bedrooms in the dwelling and the ability of the soil in that area to accept water. If the number of bedrooms cannot be used, as in the case of commercial or industrial structures, the absorption area will be sized using the projected maximum daily flow rate and the suggested application rate of the soil in that area.

b) The Department shall determine the minimum required absorption area for each particular system from any or all of the following: previous experience in a particular area, percolation tests, soil information received from test holes and any other topographic or geologic features observed during site evaluations.

c) The ability of the soil in the area of the proposed drainfield to accept water, if not already known, may be determined by at least one (1) percolation test performed and reported in accordance to the procedure as outlined in the most current edition of the Montana Department of Environmental Quality Circular DEQ 4. The test shall be performed by a soil scientist, geologist, engineer, registered sanitarian or other person(s) with soil sciences qualifications acceptable to the Department. The Department may request more than one (1) percolation test be performed if the area of the absorption field is anticipated to be large or if there appears to be a variability to the soils in the area. If the Department feels, after reviewing the percolation test results, they are not representative of the type of soil in the area, additional percolation tests may be required before a permit is issued. Soil texture may be used in determining the sizing of the absorption field, but may not necessarily preclude the percolation test due to possible soil variability. Sizing based on soil texture shall generally conform to those standards as stated in Circular DEQ 4.

NOTE: Percolation tests performed by permit holders will not be accepted unless approval by the Department has been granted prior to performing the tests. Percolation tests performed by individuals and signed off by persons approved by the Department will be accepted.

d) The Department may advise the applicant to seek assistance from a professional engineer if, in the opinion of the Department, the results of percolation tests and other environmental factors warrant it.

9.3 Standard Drainfield Design & Construction

1) Uniform pressure distribution shall be utilized to convey and distribute effluent within the drainfield.

2) Absorption trenches must be separated by at least 4 feet of undisturbed material between trench walls.

3) Drainfield trenches must be at least 24 inches wide, but may have drainfield trenches up to 36 inches wide.

4) The bottom of the drainfield trenches must be at least 12 inches and no more than 36 inches below the natural ground surface. There must be a minimum of 12 inches of soil or fill material above the drainrock. When the bottom of the trench is less than 24 inches below ground, a cap above the natural ground surface is required. The cap must be tapered from the edge of the outermost trench wall with a 3 horizontal to 1 vertical or flatter slope. The cap must be sloped to provide positive drainage away from the center of the drainfield.

5) The maximum trench depth from finished grade shall not exceed 36 inches

NOTE: The three (3) foot depth is not the required depth of all trenches, it is the maximum depth allowed by the Department under normal conditions. If soil conditions are such, or groundwater or bedrock conditions pose a problem, the maximum depth of the trenches for that specific situation may be decreased to accommodate the circumstances that prevail. The maximum trench depth for each system will be specified on each application form. In certain situations a soil absorption system constructed deeper than the standard system as defined in these regulations may be the best system for that area, e.g., silty clay layers over sand or gravel layers. In such cases the system must be approved by the Department prior to construction

6) Drainfield trenches may not exceed 100 feet in length from where effluent is first applied to the soil.

7) The bottom of the drainfield trenches shall be level.

8) Gravelless chambers are considered as standard in Flathead County. When used, a 25% reduction in absorption area will be allowed.

9) If a newly constructed drainfield will not provide uniform distribution within the drainfield, the system shall be disapproved. The material used to cover the top of the drainrock must be synthetic drainage fabric or several (two to four) layers of untreated building paper. A 5 inch layer of straw may be substituted when these materials are unavailable. Nonporous plastic or treated building paper may not be used.

10) At least 6 inches of drainrock must be placed in the bottom of the trench.

11) The distribution pipe must be covered with at least 2 inches of drainrock and the drainrock surface must be level throughout each trench.

12) The ends of the distribution pipes must be capped.

13) When the trenches have been excavated, the sides and bottom must be raked to scarify any smeared soil surfaces. Construction equipment not needed to construct the system should be kept off the area to be utilized for the absorption trench system to prevent undesirable compaction of the soils. Construction must not be initiated when the soil moisture content is high.

NOTE: If a sample of soil within the working depth can be easily rolled into the shape of a wire or cast, the soil moisture content is too high for construction purposes.

Chapter 10 - Simple Alternative Treatment Systems

10.1 General

1) Simple alternative wastewater treatment systems may be permitted where site conditions are such that a conventional system cannot be installed. The applicant may be required to provide substantiating evidence that the installation, alteration or repair of said sewage treatment system will not adversely affect or injure any property, the health or safety of any person, surface or ground waters, or will not conflict with purposes of these regulations.
2) A standard alternative system may be designed and submitted by the applicant. A detailed design report, plans, and specifications package prepared by an engineer is not typically required for simple alternative systems. However, where deemed appropriate by the Department, one may be required.

3) Design criteria shall conform to the minimum design criteria set forth in this Section.

4) Simple alternative wastewater treatment systems include:
Waste segregation systems
Deep absorption trench systems
Sand lined drainfields

10.2 Waste Segregation Systems

1) General
A sewage treatment system may include a facility for dry disposal of human waste such as various composting, chemical and incinerator type systems with separate collection of greywater. However, regardless of the type of dry disposal system used, the greywater. must be treated in an approved wastewater treatment system.

2) Limitation
Waste segregation systems will only be considered where it is demonstrated that the parcel has an acceptable drainfield and 100 % replacement site for future development needs.

3) Maintenance
A written plan of maintenance and final disposal of humus must be provided (if appropriate).

4) Pit privies
Installation of pit privies is prohibited in Flathead County.

10.3 Deep Absorption Trench System

1) General
a) Any drainfield trench which exceeds 36 inches in depth from the natural ground surface shall be considered a deep absorption trench system. Deep absorption trenches may be considered where the depth of suitable soil is insufficient to permit the installation of a conventional trench system due to the presence of a limiting layer more than two (2) feet in depth which overlies suitable soils of sufficient thickness. Requirements for location, design, slope, material, and construction, except for depth of construction, shall be the same as required for standard subsurface drainfield systems.

b) The site evaluation must include soil profile descriptions of at least two soil observation pits excavated to a minimum depth of 4 feet below the proposed trench bottom. Monitoring to establish depth to seasonally

high ground water may be required where the reviewing authority has reason to believe that ground water is within 6 feet of the bottom of the absorption trench.

2) Design

a) Deep absorption trench systems shall not exceed five (5) feet in depth and shall be backfilled with a suitable material to a depth of three (3) feet below the ground surface when possible.

b) The site evaluation procedure shall include soil profile observations of at least one (1) soil observation pit excavated to a minimum depth of four (4) feet below the proposed trench bottom.

c) Distribution pipe for a deep absorption trench must be installed at the same depth requirements as for the standard absorption trench. The deep trench must be dug 1 foot into the acceptable soil and backfilled with a medium sand (with no more than 3 percent finer than the No. 100 sieve) or other approved material to the level of a standard absorption trench. The system must be sized based on the lesser application rate for the soil infiltrative surface or the backfill sand.

10.4 Sand Lined Drainfields

1) General

Sand lined drainfields will be considered when soils are determined to be a poor filter medium or when percolation tests show results of rates faster than five (5) minutes per inch. The Department may require sand lined drainfields when a danger of groundwater pollution exists.

2) Limitations

Sand lined drainfields shall not be used in soil which is extremely coarse and lacking in fines (soil particles less than 2mm in diameter) throughout the profile.

3) Location

Site requirements shall meet the minimum standards for standard drainfield systems.

4) Design and Construction

Trenches must provide a minimum of 12 inches of fine to medium sand or loamy sand below the constructed drainfield.

5) Sand shall not be allowed to enter into the washed gravel zone during construction.

Chapter 11 - Complex Alternative Systems

11.1 General

1) Complex alternative treatment systems include:

Elevated Sand Mound	Recirculating trickling filters
Aerobic Treatment Units	Nutrient Removal System.
Subsurface (Intermittent) Sand Filter System	Recirculating sand filters
Experimental Systems	

2) Proposals for complex alternative systems may be considered for sites which are not suitable for conventional or simple alternative systems. The report, plans and specifications for complex alternative systems shall be prepared by a registered professional engineer. Two copies of each must be submitted to the Department. The applicant may be required to provide substantiating evidence that installation, alteration or repair of said sewage treatment system will not adversely affect or injure any property, the health or safety of any person, surface or groundwaters, or will not conflict with purposes of these regulations.

11.2 Report

Where subsurface drainfields are utilized, the following information shall be shown in a report or on the plan:

1) Quantity of sewage flow and how it was determined,

2) Depth to seasonal high groundwater and how this information was obtained,

3) Natural slope of land,

4) Percolation test results in the immediate vicinity of the subsurface drainfield(s) and the specific location of the test holes,

5) Soil description, how it was determined and the specific location of the test holes,

6) Depth to bedrock,

7) Location of watercourses, lakes and impoundments including the 100 year floodplain in the immediate area, and,

8) Name of person who performed site evaluation and soil descriptions and qualifications of that person.

11.3 Plans and Specifications

The following information shall be provided in the plans and specifications:

1) Lot layout showing the location of the proposed sewage treatment system, 100 percent replacement area, house site, property boundaries, driveways and other pertinent site factors which may affect the placement of the sewage treatment system on the lot.

2) The location of any proposed or existing well or water lines on the lot or adjacent lots,

3) The location of streams, lakes, watercourses, swamp(s) and seeps on or adjacent to the lot,

4) A plan view and profile view of the proposed treatment system including pumping stations if applicable,

5) A design report or calculations used to determine the size and configuration of the system.

11.4 Design

Publications such as the EPA Design Manual *On-* Site *Wastewater Treatment and Disposal Systems (October 1980), Recommended Standards for Individual Sewage Systems (1980* Edition), University of Wisconsin design and construction manuals, *Design of Pressure Distribution Networks for Septic Tank-Soil Absorption Systems January 1981),* and the *Design and Construction Manual for Wisconsin Mounds (September 1978)* as published by the "Small Scale Waste Management Project", shall be used as design guidelines. Criteria within these manuals that conflicts with these regulations shall not be used for design purposes. Upon completion of the project, the designer must submit written certification to the Department the construction was in accordance with approved plans and specifications.

11.5 Location

All complex alternative systems shall be sited according to specific criteria contained in Table 1 of these regulations and as modified by this section.

11.6 Monitoring

Post construction inspections by personnel who designed the system may be required of systems in this category. In general, bi-annual on-site inspections documenting usage, maintenance, system operation and malfunction or failure may be required of the designer. Groundwater analysis and/or other special monitoring requirements may be stipulated for some types of systems. If deemed necessary by the Department, monitoring shall be conducted for a minimum of three years following completion of the system unless the system is not in continuous use whereby this period may be extended. In all cases the property owner shall be responsible for all monitoring costs incurred. If monitoring will be required, a guaranteed commitment to monitoring must be established prior to approval of system design.

11.7 Elevated Sand Mound

1) General

Elevated sand mounds may be considered whenever site conditions preclude the use of conventional or standard alternative subsurface absorption systems. The construction of a mound shall be initiated only after a site evaluation has been made and landscaping, dwelling placement, effect on surface drainage and general topography have been considered. Due to the nature of this alternative system, actual selection of mound location, size of mound and construction techniques must be carefully considered and the criteria established in this section implicitly followed.

2) Location

a) Elevated sand mounds shall not be utilized on soils where the high groundwater level, bedrock, or other strata having a percolation rate slower than 120 minutes per inch occurs within 36 inches of natural grade or where rapid percolation may result in contamination of water-bearing formations or surface waters. Elevated sand mounds shall be constructed only upon undisturbed naturally occurring soils.

b) Elevated sand mounds shall be located in accordance to Table 1, as measured from the outer edge of the mound.

c) Elevated sand mounds shall be located a minimum distance of 10 feet as measured from the outer edge of the mound from property lines, buildings, driveways, or any other subsurface obstructions except that this distance shall be 50 feet on the down gradient side of the mound. There shall be a minimum 25 foot setback from escarpments. The land area for a distance of 50 feet down gradient of the elevated sand mound shall be considered the effluent dispersal area and soil in this area may not be removed or disturbed except as specified herein. No future construction activity is to take place in the effluent dispersal area described in this section as long as the mound is in use.

3) Fill Material

The fill material shall be a clean uniform sand (washed masonry or concrete sand) with a maximum of 50 % of the particles by weight equal to or less than 0.1 mm and greater than 0.05 mm (very fine sand). The remaining sand fragments shall consist of 0.1 mm to 2.0 mm particle size (fine to very coarse sand) with a minimum of 25 % with a particle size of 0.25 mm to 0.5 mm (medium sand).

4) Design

a) The EPA Design Manual *On-Site Wastewater Treatment and Disposal Systems (October 1980),* pages 250 to 255, is recommended as a procedural guideline in the design of elevated sand mounds.

b) There shall be a minimum of four (4) feet of suitable soil (less than 120 minutes per inch) between the infiltrative surface and the limiting conditions. A minimum of 12 inches of fill material shall be placed between the native soil material and the washed rock.

c) Gravel or crushed stone shall be washed and shall range in size from 3/4 to 2 1/2 inches.

d) Elevated sand mounds shall generally utilize absorption bed design, and shall not be installed on land with a slope greater than 12 % for permeable soils (1-29 min/inch) nor installed on land with a slope greater than 6 percent on tighter soils (30-120 min/inch). The minimum spacing between beds or trenches shall be four (4) feet. The minimum trench width, when utilized, shall be two (2) feet and the trench side walls shall be lined with a synthetic filter fabric to maintain the separation between the trench gravel and the sand mound. The absorption field shall be installed with the long dimension parallel to the land contour.

e) The absorption field should be rectangular in shape with the long dimension at least three (3) times the short dimension.

f) The required bottom area of the gravel or leaching chambers shall be based upon a flow determined in accordance with Chapter 4 of these standards application rate of 1.0 gallons per day per square foot.

g) The area of sand fill shall be sufficient to extend two (2) feet beyond the edge of the required absorption area before the sides are shaped to a four (4) horizontal to one (1) vertical or lesser slope. On sloping sites, the downslope setback shall be based upon soil permeability. The cap at the edge of the absorption area shall be a minimum of 12 inches and shall be a minimum of 18 inches at the center of the bed. These depths include 2-4 inches of topsoil.

h) Elevated sand mounds shall be pressure dosed.

5) Construction

a) Construction equipment which would cause undesirable compaction of the soils shall not be moved across the plowed or excavated surface of the effluent dispersal area. However, after placement of a minimum of six (6) inches of sand fill over the plowed area, construction equipment may be driven over the protected surface to expedite construction. Construction and/or plowing shall not be initiated when the soil moisture content is high. (Note: If a sample of soil obtained from approximately nine (9) inches below the surface can be easily rolled into wire, the soil moisture content is too high for construction purposes.)

b) Above-ground vegetation and decomposing organic matter must be removed from the ground surface throughout the area to be utilized for the placement of the fill material. Prior to plowing, excavating, or scarifying, the dosing pump discharge line from the pump chamber to the point of connection with the distribution piping header shall be installed. The area shall then be plowed, excavated or scarified to a depth of seven (7) to eight (8) inches, parallel to the land contour with the plow throwing the soil upslope to provide a proper interface between the fill and natural soils. Tree stumps should be cut flush with the surface of the ground and roots should not be pulled.

c) The area surrounding the elevated sand mound shall be graded to provide for diversion of surface runoff waters.

d) Construction should be initiated immediately after preparation of the soil interface by placing all of the sand fill needed for the mound. After hand leveling of the absorption area, the stone should be placed into the bed, and hand leveled. Trench sidewalls (if utilized) should be protected by placing synthetic filter fabric as a liner. Place the distribution pipe, conduct the pressure testing and cover the pipe as specified. After installation of the distribution system, the entire mound should be covered and carefully graded with ten (10) inches of a finer textured soil material such as or silt loam. A two (2) inch layer of topsoil should then be added. The entire mound should be crowned by providing a minimum of 12 inches of cover on the side slopes, with a minimum of 18 inches over the center of the mound. The entire mound shall be sodded or seeded and covered with a soil

stabilization fabric to assure stability of the installation. Other methods of providing vegetative cover must be approved by the Department prior to construction.

11.8 Aerobic Sewage Treatment Units

Design and installation of Aerobic Sewage Treatment Units shall be in accordance with circular DEQ 4.

11.9 Intermittent Sand Filters

Design and installation of Subsurface (Intermittent) Sand Filters shall be in accordance with circular DEQ 4.

11.10 Recirculating Sand Filters

Design and installation of Recirculating Sand Filters shall be in accordance with circular DEQ 4.

11.11 Recirculating Trickling Filters

Design and installation of Recirculating Trickling Filters shall be in accordance with circular DEQ 4.

11.12 Nutrient Removal Systems

Design and installation of Nutrient Removal Systems shall be in accordance with circular DEQ 4.

11.13 Gravelless Absorption Trench Systems:

Design and installation of Gravelless Absorption Trench Systems shall be in accordance with Circular DEQ 4, except that all systems shall employ uniform pressure distribution and installation of "at grade absorption trenches", "evapotranspiration systems", and "evapotranspiration absorption systems" are not permitted in Flathead County.

11.14 Experimental Systems

Design and installation of Experimental Systems shall be in accordance with circular DEQ 4.